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DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

POULTRY DIVISION

POULTRY FEEDS AND FEEDING

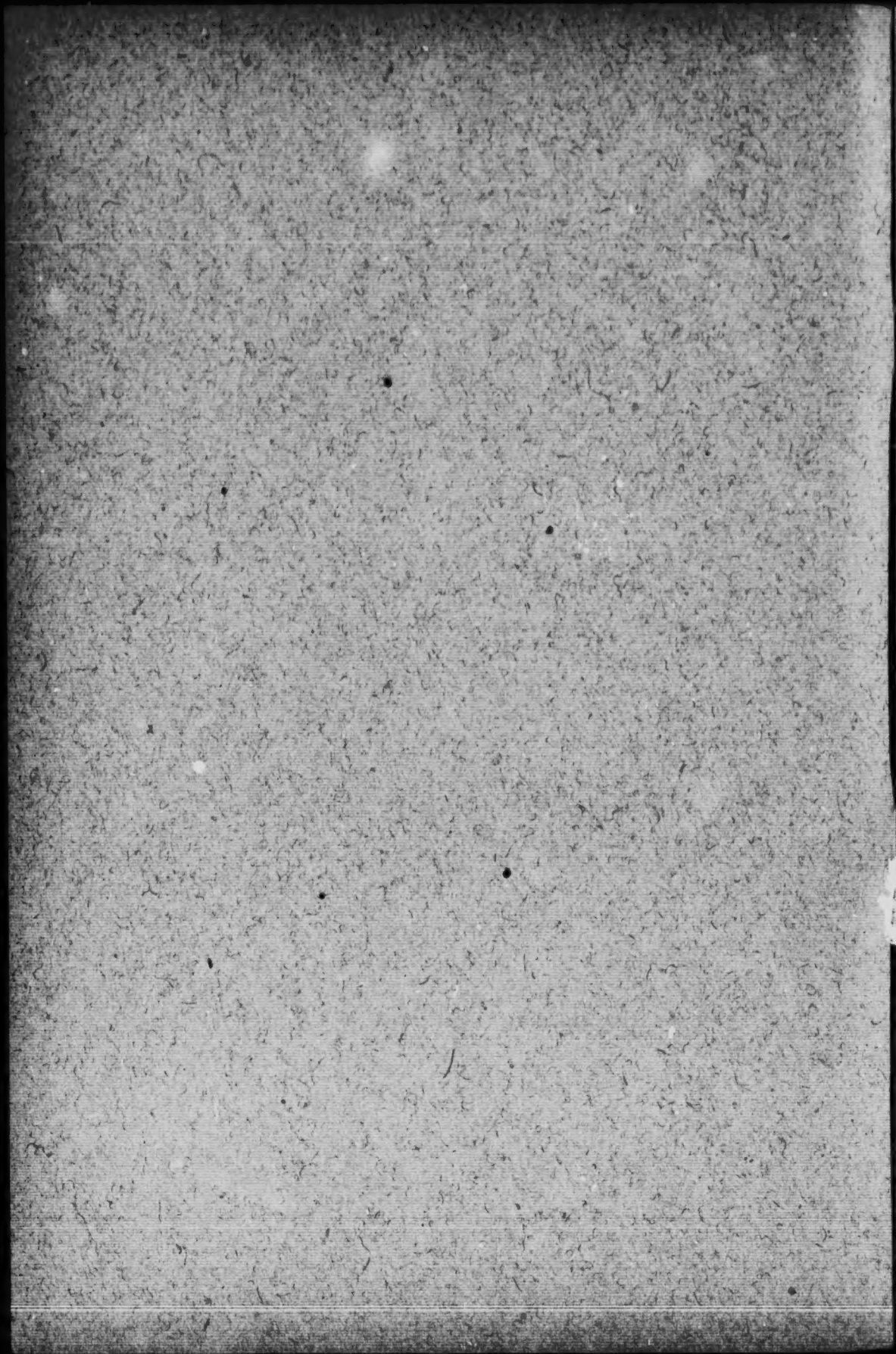
BY
GEORGE ROBERTSON, Assistant.

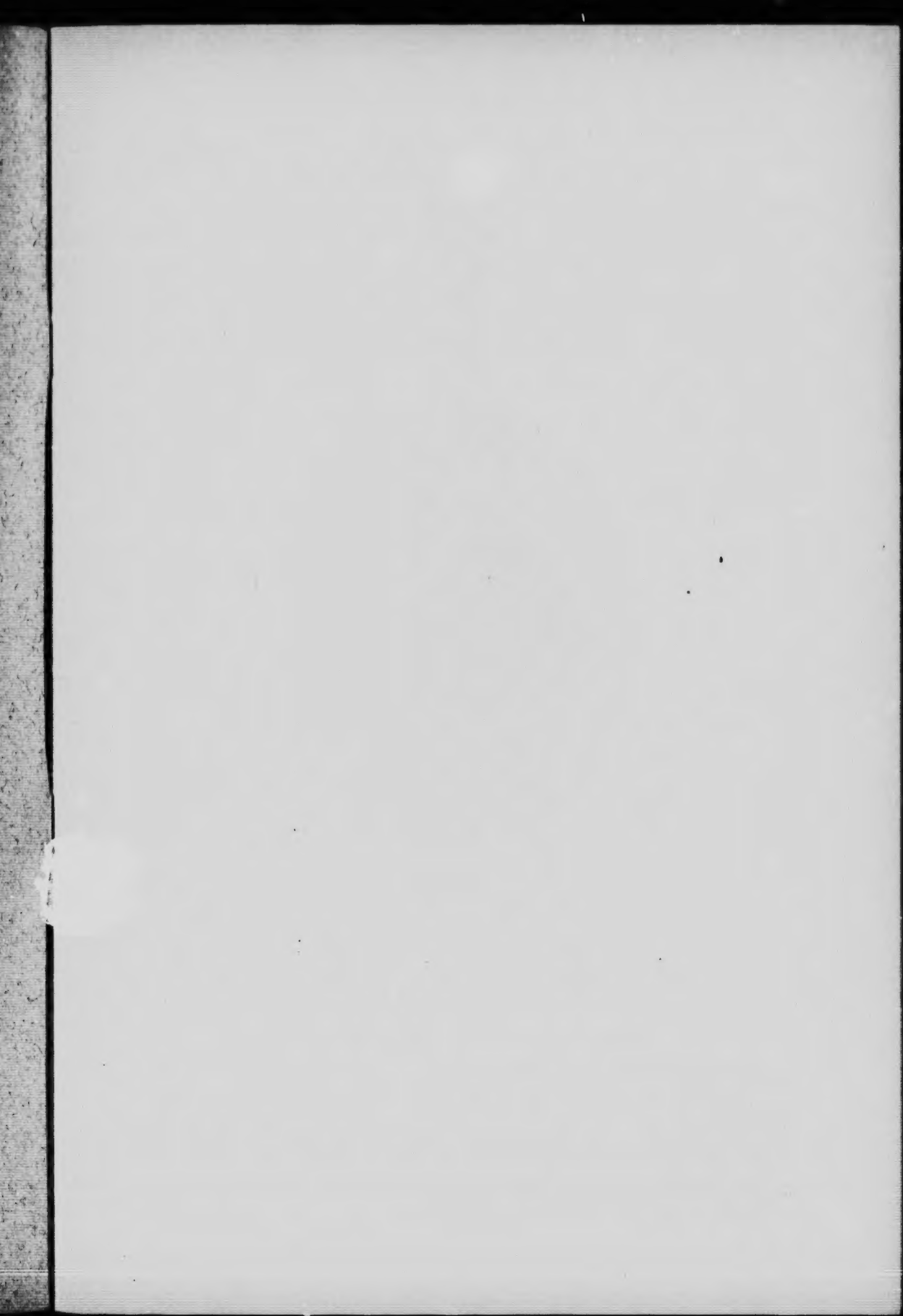
BULLETIN No. 91

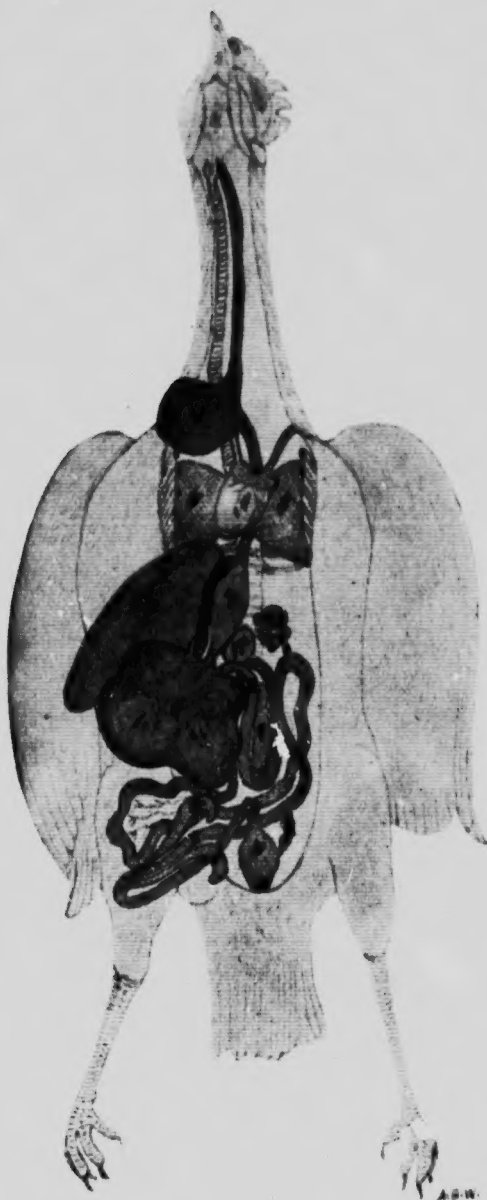
Printed by authority of the Hon. Thomas Crerar, Minister of Agriculture,
Ottawa, Canada

OTTAWA
J. DE LABROQUERIE TACHÉ
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1918

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DESCRIPTION OF PLATE SHOWING DIGESTIVE ORGANS OF FOWL.

The food after entering the mouth passes into the Gullet (No. 1) thence into a sack-like enlargement of the former, called the Crop (No. 2) from where it passes into the true Stomach (No. 3) where it is mixed with the digestive juices after which it passes into the Gizzard (No. 4) where it is ground fine, then into the Duodenum (No. 5) (first portion of the small bowel) where a secretion from the Liver (No. 6) called Bile which is stored in the Gall Bladder (No. 7) and also the juices from the Pancreas (No. 8) are mixed with it; then passes through the long Intestine (No. 9) where absorption takes place and into the Caeca (No. 10) after which the residue is passed on into the Rectum (No. 11) and through a continuation of the rectum called the Cloaca (No. 12) (junction of the intestine and the oviduct) to be Voided at the Vent (No. 13).

Other organs shown are: (No. 14) Heart, (No. 15) Lungs, (No. 16) Ovary, (No. 17) Spleen, (No. 18) Margin where left lobe of liver has been removed, (No. 19) Oviduct.

Original drawing by Dr. A. B. Wickware, Asst. Pathologist.

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**BY
GEORGE ROBERTSON, Assistant.**

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**OTTAWA
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PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1918**

OTTAWA, October 2, 1918.

The Honourable
The Minister of Agriculture,
Ottawa.

SIR,—I have the honour to transmit herewith the manuscript of Bulletin No. 91 of the regular Experimental Farms' series, entitled Poultry Feeds and Feeding, and prepared by Mr. George Robertson, Assistant.

The demand for a greater production of food on the one hand, and the high cost of feeds, on the other, should render this bulletin most interesting and valuable to the ever-increasing number of those engaged in poultry raising.

I have to recommend, therefore, that a large edition of this publication be brought out.

I have the honour to be, sir,
Your obedient servant.

J. H. GRISDALE,
Director, Dominion Experimental Farms.

OTTAWA, October 2, 1918.

The Director,
Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to transmit herewith the manuscript of a bulletin entitled "Poultry Feeds and Feeding" prepared by Mr. George Robertson, Assistant.

The question of feeds is always an important one, and it is especially so at present when the usual poultry feeds are so hard to get and all feeds so high in price.

The information contained in this bulletin should assist all who keep poultry to feed their flock more intelligently and to better advantage. Intelligent feeding means economy in production, and the bringing down of the cost of production should mean a better margin to the producer, or a less price to the consumer.

I have the honour to be, sir,
Your obedient servant,

F. C. ELFORD,
Dominion Poultry Husbandman.



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POULTRY FEEDS AND FEEDING.

INTRODUCTION.

The feeding of poultry is more or less like the feeding of any other live stock, and the ration used must be varied according to the purpose for which it is intended. For successful feeding it is necessary to use grains, both whole and ground, green food, animal food, water liberally supplied, and grit and oyster shell. Charcoal may also be used to advantage.

These feeds must not only be supplied, but they must be supplied in such quantities that they will form a ration suited to the purpose for which it is intended. Such a ration is called a balanced ration.

A BALANCED RATION.

A balanced ration is one that contains protein, carbohydrates, and fat—the elements of nutrition—in the proper proportion required for the maintenance and activities of the animal to which it is fed.

Protein.—Protein is the nitrogenous part of the food, and is largely used for growth, the repairing of waste tissue, and for reproduction. The production of eggs and similar products depends largely on the protein in the feed.

Carbohydrates.—Carbohydrates are largely starches and sugars, and are used for the supplying of bodily heat and energy.

Fats.—Fats are frequently classed as carbohydrates. They serve the same purposes, but are more highly concentrated.

An overplus of protein in a ration may be used to replace a shortage of carbohydrates and fat, but as protein is the most expensive element to supply it is not economical to use it for that purpose. Carbohydrates and fat, on the other hand, cannot take the place of protein, so that a ration deficient in protein, no matter how rich in carbohydrates and fat, cannot give good results.

Ash.—Besides the three fore-mentioned elements, ash, which is the term used to designate the mineral compounds, is also of importance, as it enters largely into the formation of bones and egg shells, but as it is present in all ordinary feeds or is readily supplied in sufficient quantity by the addition of grit, bones, or oyster shell, very little attention need be given to it.

DIGESTIBLE NUTRIENTS.

While the composition of the various foodstuffs, as determined by chemical analyses, is to a certain extent indicative of their value, the only reliable test is by actual feeding experiments. These experiments consist in the weighing and analysing of the feed of which it is desired to find the value, feeding it, and collecting, weighing, and analysing all the resulting excrement. The difference between the weight and analysis of the feed and the excrement is the amount assimilated or digested, or, in other words, the digestible nutrients. In compounding a ration, the use of figures representing digestible nutrients

would be the best method to follow but, unfortunately, comparatively few reliable feeding experiments have been carried out with poultry, so that it is necessary in most cases to depend on the feeding results with some of the larger animals.

The dearth of material from reliable poultry-feeding experiments is due to the fact that urine contains the broken down tissue of the body. In fowl the urine is emptied into the cloaca and becomes mixed with the faeces before being discharged, instead of being carried off by an entirely separate channel, as is the case in most animals. When the excrement—the combined urine and faeces—is analysed, it is extremely difficult to distinguish the broken-down body tissue from the unassimilated portions of the food. Possibly the best way to avoid confusion is by a surgical operation to divert the urine from its usual channel so that it will be voided without becoming mixed with the faeces. This has in some cases been done, but in comparatively few instances have the birds returned to a normal condition that would permit of trustworthy results being obtained.*

In the table of feeds given on pages 18 and 19, the figures used representing the digestible nutrients were taken from the reports of poultry-feeding experiments where possible. Where these were not available, the figures given were taken from the results of feeding experiments with some of the larger animals. The composition of the feeds is also given in this table.

THE NUTRITIVE RATIO.

As the term nutritive ratio will be used frequently in this bulletin, it will be necessary to have a clear understanding of its meaning.

The nutritive ratio is the ratio which exists between the protein in a given feed and the carbohydrates and fats. For example, wheat contains 11.9 protein, 71.9 carbohydrates, 2.1 fat. The fat being much more concentrated, to bring it to the same value as the other carbohydrates it must be multiplied by 2.25. Therefore, to find the nutritive value of wheat, multiply the fat 2.1 by 2.25, add the carbohydrates 71.9, and divide by the protein 11.9, which gives 6.4 or, in other words, for every one part of protein there are 6.4 parts of carbohydrates, so that 1 : 6.4 is the nutritive ratio of wheat.

In referring to rations the terms "narrow" and "wide" refer to the amount of protein in comparison to the combined amount of carbohydrates and fat. These are relative terms, and are in no way fixed. Where the difference between the percentage of protein and carbohydrates is not large, the ration is said to be narrow, and where the difference is great the ration is said to be wide.

A ration that is more or less generally accepted as suitable may be conveniently used with which to compare other rations: for instance, a suitable chick ration would have a nutritive ratio of about 1 : 3.5 to 1 : 4.5. The feathering period calls for a ration rather narrower than the ordinary growing period. The same applies to mature fowl; a maintenance ration would have a nutritive ratio of about 1 : 6 to 1 : 6.5, and a fattening ration may be even a little wider, but when a flock is laying heavily, the ration should be narrower, about 1 : 4 to 1 : 5, and during moulting even narrower still, about 1 : 3.5.

It will be readily seen from the foregoing that, in compounding rations, it is advisable to consider the object for which the ration is intended. It is not meant by this carefully to weigh out a given quantity of each variety of feed each day, but it is advisable so to feed that the fowl will be able to get enough

* Bartlett Maine Experiment Station, Bulletin 184.

of each food element to satisfy the demands that are being made on its system without having to consume far more of other food elements than it can properly make use of. For instance, it is impossible to feed a fowl an exclusive corn diet and expect it to lay well or to come through the moult in good condition. To get the amount of protein that it requires, it will be necessary for it to consume far more carbohydrates than it needs; the result will be that the overplus of carbohydrates will be stored as fat, and the fowl will get into such a condition that it will be useless for anything except market purposes.

On the other hand, it is not advisable to use a larger amount of protein than is required, as it is the most expensive element and, consequently, an overplus of protein would unnecessarily increase the cost of the ration.

GRAIN FOODS AND THEIR BY-PRODUCTS.

The grains most popular are wheat, corn, and oats. Barley and buckwheat are also largely used, and some other grains to a less extent.

WHEAT.

Wheat is undoubtedly more largely used in Canada for feeding poultry than any other single grain. There are several reasons why this should be so. There is such an enormous quantity produced that there is always an available supply of the lower grades. The kernels are of good size for feeding, are palatable, are free from objectionable hull, and contain the principal nutrients in about the proper proportions. The lower grades usually make excellent feed; in fact, shrunken wheat is considerably richer in protein than the higher-grade wheats, but, when buying it, precaution must be taken to see that it is perfectly sweet, as musty or fermented feeds are always dangerous to use.

By-products of wheat.—The by-products of wheat are extensively used, and provide some of the best foods for the feeding of all kinds of poultry.

BUCKWHEAT SCREENINGS.—Buckwheat screenings, so called, are a by-product from the elevators. They consist of approximately 50 per cent small or broken wheat, 40 per cent wild buckwheat, 2.5 per cent light oats, 1 per cent flax seed, and 6.5 per cent weed seeds, chaff, and other refuse. It is a valuable feed and, particularly for fattening purposes, may be used to advantage. (See report of Poultry Division for 1914.)

STANDARD RE-CLEANED SCREENINGS.—When it was decided that screenings would of necessity have to be largely substituted for the milling grades of wheat in the feeding of poultry, a definite standard was set on which screenings would be sold. This grade was named Standard Re-cleaned screenings, and, in buying such, feeders may depend on getting a feed that must come up to the standard set by the Government, just as they would if buying any of the recognized milling grades of wheat. There is a larger percentage of chaff and waste than in "Buckwheat Screenings," but on account of the proportion of wheat being larger, and the wild buckwheat smaller, the protein content is higher. The screenings consist of approximately 52.7 per cent small or broken wheat, 23.2 per cent wild buckwheat, 2.3 per cent flax seed, 9.5 per cent oats, 12.3 per cent black seeds, straw and other refuse.

During the season of 1917 screenings were used as hopper feed on range, with excellent results.

BRAN.—BRAN is composed of the coarser parts of wheat, and is valuable in the making of mashes, not only on account of its nutritive qualities, but for its effect in supplying bulk with other feeds which, used alone, would make a mash that would be too sticky.

SHORTS—MIDDLINGS.—Unfortunately, of late, the terms shorts and middlings have been used indiscriminately, and may mean anything from reground bran with a little mill sweepings thrown in, to middlings proper, which is a high-class feed more closely resembling low grade flour.

Shorts, when clean, are a valuable feed, but they are coarser than middlings, and have not so much of the floury parts of the grain, so are not as suitable for mixing with bran.

Middlings have less crude fibre, are richer in nutrients than shorts, and give more "body" to a mash. Either middlings or shorts is the foundation of most Canadian mashes. In some localities, it is impossible to get a good grade of middlings, in which case dependence had better be placed on "Red Dog" or low-grade flour.

LOW-GRADE FLOUR.—Low-grade flour is not only a nutritious feed, but it is especially valuable in giving the proper consistency to a mash.

STALE BREAD.—Stale bread is a very palatable feed, and is of special value in the feeding of young stock.

SHREDDED WHEAT WASTE.—Shredded-wheat waste is a by-product from the manufacture of shredded wheat biscuits. It is baked shredded whole wheat, and is very palatable. Fed soaked in milk it is greedily eaten and, when procurable, it is an acceptable addition to the poultry menu.

CORN.

Corn has never been fed in Canada as freely as in the United States. This is no doubt due to the fact that corn is not produced here to the same extent. The idea is prevalent among poultry keepers that flint corn is the best, but it is doubtful if there is much ground for this idea, as the analyses of the two are very similar.

Whole corn is so large that care must be taken in its use, or the fowl will obtain a full meal with very little exercise, and rapidly become too fat. On that account, it is much better to have the corn cracked and scattered in the litter so that the flock will have to work for it. Corn heats very readily, and unless it is kiln dried it is almost impossible to keep it from spoiling in warm weather. Care should be taken to see that it is perfectly "sweet", as there is always danger in feeding if mouldy. Corn, being rich in carbohydrates, may be much more freely used in winter than during the warmer weather.

Corn Meal.—Most of the mashes used contain more or less corn meal, and what was said with reference to the precaution necessary to avoid the use of tainted corn applies even more to corn meal or corn chop.

By-products of Corn.—The by-products of corn are not used to any great extent in Canada, but where they can be obtained at sufficiently low prices they may be used advantageously.

GLUTEN MEAL.—Gluten meal is very rich in both protein and fat, and is a valuable addition to the mash when used in conjunction with other feeds. In buying feeds of this kind it is always best to insist on a guaranteed analysis being supplied, and in gluten meal especially is this necessary as there is frequently great differences in feeding value.

GLUTEN FEED.—Gluten feed should not be confused with gluten meal. It is a combination of gluten meal and other by-products, such as bran, and is not nearly so rich in nutrients.

BRAN, MIDLINGS, AND HOMINY MEAL.—These are not available in this country to any extent. The bran is considerably lower in food value than corn meal, but the middlings and hominy are somewhat higher.

OATS.

Many poultry keepers do not give oats the place in the ration they should have. This is probably due to the fact that much of the oats that are placed on the market are not properly filled, and when offered to fowl, are not eagerly eaten.* Oats have a fibrous hull, and it is probably largely on that account that fowl take more readily to wheat or corn, but, where oats are of good quality, they are an excellent feed, and as soon as the flock becomes accustomed to them, they will eat them readily.

Oatmeal.—Oatmeal was formerly used to a considerable extent in the feeding of chicks, and at the present time pinhead oatmeal is used in nearly all chick-grain mixtures, but rolled oats are now used much more freely. It is a very valuable feed and, where it can be obtained at a reasonable price, should be used. Many high-class breeders use it freely for the feeding of chickens even when they have to purchase the superior product intended for human food, and claim that even at that cost, the results justify its use.

By-products of Oats.—By-products from the oatmeal mill are not now readily obtainable, as they are generally put into mixtures and sold as such. Oat middlings is the best of these. It is an excellent feed and where obtainable may well be used.

BUCKWHEAT.

In some sections buckwheat is utilized to a considerable extent. Like oats, fowl have to become more or less accustomed to it, but once used to it they eat it readily. Ground buckwheat is especially valuable in crate feeding. It produces white flesh of fine flavour.

By-products of Buckwheat.—It is so seldom that the by-products of buckwheat can be had that they are hardly worth mentioning. The middlings is a high-class feed and may be used to advantage for feeding in mashers to any class of fowl.

BARLEY.

There is very little difference in the analysis of barley and wheat, the barley being a little higher in protein. The hull makes it less palatable, but fowl soon become accustomed to it, and consume it readily. It might well be used to a far greater extent than it is, as it apparently gives almost as good results as wheat, and is usually much cheaper. Barley meal is used to a considerable extent, especially in crate feeding. It gives satisfactory results both in quantity and quality of flesh produced.

BREWER'S GRAINS.—Brewer's grains, when fed fresh from the breweries, make an excellent feed, but care should be taken to see that they are fresh, as they are otherwise liable to flavour the eggs. Dried, they may be used to advantage as they keep well and are rich in both protein and fat.

MALT SPROUTS.—In the process of malting to change the starch of the grain into sugar it is necessary to produce a natural ferment called diastase. To develop this ferment it is necessary to sprout the grain, and as it is the change that is desired and not the actual sprout, the sprouting is checked as soon as the change takes place. The whole is then kiln dried and the sprouts are separated from the grain by means of sieves, and sold as stock feed. As they contain a high percentage of protein they make a valuable addition to a ration, but they are best fed in combination with more palatable feed, as they are not greatly relished.

*The Liberty Oat, originated by Dr. C. E. Saunders, Dominion Cerealists, and now being introduced to the public, threshes out free from hull and will doubtless prove most valuable in poultry feeding by removing this difficulty.

RYE.

Although, in analysis, rye shows very little below wheat in feeding value, it is in very little favour as a poultry feed. Fowl do not like it and, unless they are forced to eat it by having other grains curtailed, they will consume it in only very limited quantities. Its by-products are practically not available in this country.

RICE.

Rice is rarely used except in the feeding of young chicks. There is generally broken rice in all chick-grain mixtures, and in special instances it is sometimes boiled and fed like a mash, in which condition it is eaten with relish. Boiled rice is of especial value as a regulative in case of bowel trouble.¹

MILLET.

Millet is very similar to oats in composition but, like rice, it is used mainly in chick feeds. It appears to be particularly attractive to the chicks, as it is one of the first grains they will pick out when they are fed mixed grains.

SUNFLOWER SEEDS.

Sunflower seeds are not fed extensively, but many town poultry keepers grow a patch of sunflowers for their fowls, bending the heads down as soon as the seeds fill, and allowing the hens to help themselves. They are of especial value to "fanciers," who use them at moulting time and also for getting coloured birds ready for the show, as they give the coveted gloss to the plumage.

PEAS.

Peas are not used to any great extent, probably because they are not readily procurable at prices that would make them profitable to feed. They are a valuable and excellent feed and used in combination with other grains, are readily eaten and give very good results. Most chick feeds contain broken peas.

LINSEED MEAL.

Flaxseed in the whole state is practically never fed, but ground flax, or linseed meal as it is called, is used to a considerable extent in mashies. It is very concentrated, and should be fed sparingly; otherwise, digestive troubles are likely to result.

OIL MEAL.—Oil cake or oil meal is simply linseed meal from which the oil has been extracted by pressure.

COTTON-SEED MEAL.

Cotton-seed meal is another feed which requires caution in feeding, as it is not only a very rich feed, but it seems specially liable to cause digestive disorders. It contains a large percentage of protein but, for the reasons stated, it has not been used to a great extent in this country, and other feeds are preferred as a source of protein.

OTHER SEEDS.

Other seeds such as sorghum, kaffir corn, rape, and broom corn are all good feeds, but scarcely require mentioning, as they are used only in small quantities in chick-feed mixtures.

¹ See Experimental Farms Report for 1915 Vol. II page 1143.

GREEN FEEDS.

In green feeds, the main thing to consider is succulence and palatability. Any feed that has these qualities is suitable.

Garden Truck.—Cabbage, lettuce, onion tops, or practically any waste garden truck may be utilised in the poultry yard. Unmarketable carrots, parsnips, onions, small potatoes, or similar roots may be stored and fed in the winter. These latter are more satisfactory when boiled and mixed in a mash.

Rape.—Rape is one of the best crops to grow for green feed for summer use where fowls are more or less confined. It is easily grown, gives a large yield, and fowls eat it with avidity. It is an excellent crop to freshen the runs after the breeding season.

Green Crops.—Corn, oats, rye, barley, and wheat all make good green fodder if cut at the right time and chopped into short lengths so that the fowl can readily eat them. They are especially useful in the feeding of waterfowl.

Clovers and Alfalfa.—Clovers and alfalfa may be cut green and used as fodder, or they make excellent pasture. Properly cured, they are of great value for winter feeding. The leaves usually found in mows where the hay has been stored are of especial value, and on many farms they are reserved for the use of the poultry.

Alfalfa and Clover Meal.—There is little to recommend the use of alfalfa or clover meals, if finely cut hay can be had. Much of the value of hay is lost if it is not cut before it gets too ripe. As it is much easier to grind it if it is mature, the result is that most of the meals are made from hay that has lost a great deal of its feeding value by being left until it is too old.

Jerusalem Artichokes.—Jerusalem artichokes are of much greater value as a crop for poultry feeding than is generally realized. The tops may be used as green fodder in summer or the tubers as roots for winter feeding. Both are readily eaten. The plant resembles the sunflower, but it is finer in growth, having smaller leaves, stalks, and flowers. Growing as it does to a good height, it also makes an excellent shade during the hot weather.

Beets.—For winter feeding, mangels and beets are the best form in which succulence can be provided. They are easily grown, yield a large amount of feed per acre, keep well, are handy to feed, and fowl are exceedingly fond of them. Care should be taken in planting them to see that the most suitable varieties are used. Some of the varieties of beets are not so readily eaten as others. Avoid planting those that are very hard in the flesh, as fowl prefer those that are tender.

Turnips.—Turnips are not so readily eaten in the raw state as are mangels. Better results will be obtained if they are cooked.

Apples.—Apples, especially some of the sweeter varieties, are eaten with elish by poultry and, where chickens are given the run of an apple orchard, they will eat large quantities of windfalls.

Sprouted Grains.—The use of sprouted grains, especially oats, is rapidly becoming common, particularly among breeders. While the process of sprouting is simple, it necessitates a good deal more work than the feeding of roots.

However, most people who have tried it say that it is worth while, especially for feeding the breeding stock, as they are exceedingly fond of it and it keeps them in excellent condition.

TO SPROUT GRAIN.

The conditions necessary for the sprouting of grain are heat and moisture. The following method will give satisfactory results: Put into a pail a quart and a half to two quarts of oats for each 100 hens, and pour over them water as hot as the hand can comfortably bear, allow them to stand for about 12 hours, then drain and leave for about 12 hours, after which, spread them out not more than



FIG. 1.—GRAIN SPROUTING RACK.

Of simple and cheap construction. The bottoms of the trays are wire cloth so as to permit of free drainage.

an inch deep on a warm basement floor or a wire bottomed tray, and water freely twice a day with warm water until ready for use, which will be when the sprouts are 2 or 3 inches long. They will have formed a solid mat which may be removed from the tray entire and torn into pieces to suit the flock, or the green may be clipped, leaving the roots to produce another crop.

The accompanying illustration shows a simple sprouting rack; each tray represents one day's feeding. If the rack is set on a drained cellar floor it may be used as shown, but if it has to be placed in the kitchen it will be necessary to set it in a large pan to catch the drainage. The rack should be located in a warm place, so as to force the growth as rapidly as possible.

Another simple method that has been used successfully, where considerable quantities of sprouted grain are required and where the necessary warm cellar room is available, is as follows: Take the grain that it is desired to sprout, put it into a bag, place the bag in a barrel into which sufficient warm water to cover it has been placed. Let it soak for 24 hours, then take it out and empty the grain into a bottomless barrel which has been placed wherever it will be most convenient. Let the grain stand for 24 hours, when it will have begun to heat; remove the barrel as to have it ready for the next lot and leave the grain as it stands for another 24 hours, then spread it out about an inch and a half deep on the warm cement floor and sprinkle with tepid water until ready for use, which will be in about three or four days. If the grain shows signs of moulding, add about a teaspoonful of formalin to the half barrel of water in which it is soaked. A fresh lot is soaked each day, so that there is a continuous supply available.

ANIMAL FOODS.

When fowls are confined, it is necessary to provide, in some form, animal food to take the place of the grubs and insects which they pick up when on range.

Fresh Meat.—Fresh meat is perhaps the most relished form of animal food, but it is seldom that it can be had at a price low enough to warrant its use.

Green Cut Bone.—Green cut bone is usually prepared from bones as secured from butchers' shops. These, generally, with more or less meat attached, are run through a machine and cut into fine shavings. Fowls eat this ravenously, and care must be used at the start to see that they are not fed too much of it, as it will cause diarrhoea. It is valuable for the production of eggs, but caution is required in feeding it to breeding stock, as it may adversely affect both the fertility and the hatchability of the eggs. As cut bone heats very readily, it is impossible to use it except in very cold weather, or where a fresh supply for each feed is obtainable.

Other Meat Foods.—Beef scrap, meat meal, blood meal, and other like preparations are by-products from the abattoirs and packing-houses. Some of these are excellent feeds and, on account of their keeping qualities and convenience for feeding, are more extensively used by poultry keepers than any other form of animal food. On the other hand, some of the brands offered are absolutely unfit to feed to poultry, and are suitable only for use as fertilizer. Before purchasing any of these feeds, poultry keepers should pay attention not only to their analysis, which varies greatly, but to their suitability for feeding. With a little experience, it is possible to tell at a glance whether the brand is suitable for feed or not, but if in doubt, pour a little boiling water on a sample, and the smell arising should settle the matter even with the inexperienced. If the odour is fetid the sample is unfit for food. Even when good, discretion is necessary in feeding them, as they are very concentrated and, if fed too heavily, are liable to cause digestive disturbances.

Fish Scrap.—Fish scrap is used to a limited extent, and some think very highly of it, but it is generally fed because of a scarcity of beef scrap, not because it is preferred to it. It is more popular in the feeding of waterfowl, where the eggs are to be used for hatching purposes, than it is for feeding laying hens.

COMPOSITION AND DIGESTIBLE NUTRIENTS OF FEEDS¹.

Foods.	Protein.		Carbo- hydrate.		Fat.		Nutritive Ratio.	
	Total.	Dige- stible.	Total.	Dige- stible.	Total.	Dige- stible.	Total.	Dige- stible.
CEREAL.								
Wheat.....	11.0	8.9	71.9	62.6	3.1	1.1	1:3.4	1:7.3
Buckwheat screenings.....	11.9		61.12		3.53		1:3.6	
Standard re-cleaned screenings.....	14.18		56.68		5.72		1:3.0	
Wheat Bran.....	13.4	11.0	33.9	24.70	4.0	1.40	1:4.0	1:3.6
" Shorts.....	14.9	13.2	56.8	50.0	4.5	3.8	1:4.4	1:4.8
" Middlings.....	13.6	12.8	60.4	53.0	4.0	3.4	1:4.4	1:4.7
Low-grade flour.....	13.0	8.2	63.3	62.7	3.9	0.9	1:4.0	1:7.9
Dark feeding flour.....	19.9	13.8	56.3	61.3	6.2	3.0	1:3.1	1:4.8
Stale bread.....	6.9		44.2		9.5		1:3.6	
Corn (Flint and Dent).....	10.4	8.48	70.28	64.15	5.0	4.4	1:7.8	1:5.7
Corn meal.....	9.2	6.96	66.7	59.06	3.8	3.2	1:3.2	1:9.6
Corn bran.....	9.0	7.4	63.2	59.8	5.8	4.6	1:7.1	1:8.0
Gluten meal.....	20.3	26.8	46.4	43.3	11.8	11.0	1:2.4	1:3.6
Gluten feed.....	24.0		51.2		19.6		1:3.1	
Hominy chops.....	9.8	7.5	64.6	55.2	8.2	6.8	1:3.4	1:9.4
Oats.....	11.8	8.4	69.7	63.78	5.0	4.30	1:3.0	1:4.2
Oat meal.....	14.7	11.5	67.4	63.1	7.1	5.9	1:3.6	1:8.0
Oat shorts.....	16.0	12.8	69.4	65.9	7.1	5.8	1:4.7	1:4.2
Buckwheat.....	10.0	8.9	64.5	56.1	3.2	1.90	1:3.9	1:10.2
" middlings.....	26.9	23.0	41.9	33.4	7.1	5.4	1:3.0	1:3.0
Barley.....	12.4	9.26	69.8	60.39	1.8	1.23	1:3.9	1:3.4
Brewers grains (wet).....	5.4	3.9	12.6	9.3	1.0	1.4	1:3.0	1:3.1
(dried).....	19.9	13.7	51.7	26.3	6.6	5.1	1:3.2	1:3.1
Malt sprouts.....	22.2	18.6	48.5	37.1	1.7	1.7	1:3.2	1:3.1
Rye.....	10.6	7.0	72.8	63.65	1.7	1.7	1:3.2	1:3.1
Rice.....	7.4	4.8	79.2	72.2	4	3	1:10.8	1:15.3
Millet.....	11.8	7.36	67.4	56.47	4.0	3.42	1:3.6	1:3.7
Sunflower seed.....	18.2	13.1	21.4	20.8	21.2	20.0	1:4.2	1:7.1
Peas.....	20.2	17.87	51.1	43.23	1.2	1.00	1:3.6	1:3.6
Flaxseed.....	22.6	20.6	23.2	17.1	33.7	29.0	1:4.2	1:3.9
Linseed meal (old process).....	32.9	29.3	25.4	22.7	7.9	7.0	1:1.6	1:1.6
" (new process).....	33.2	28.2	33.4	40.1	3.0	2.8	1:1.9	1:1.6
Cotton-seed meal.....	42.3	37.2	23.6	16.9	13.1	12.2	1:1.2	1:1.1
Sorghum.....	9.1	7.0	69.8	63.1	3.6	3.1	1:3.5	1:11.1
Kafir corn.....	9.9	7.8	74.9	67.1	2.0	2.7	1:3.2	1:3.0
Soya bean.....	24.0	20.6	26.8	22.3	16.9	14.4	1:1.9	1:1.8
Broom corn.....	10.2	7.4	63.6	48.3	3.0	2.9	1:3.8	1:7.4
Rape (ground).....	31.2	26.2	30.0	23.7	9.6	7.8	1:1.6	1:1.6

¹ Data taken from Henry's Feeds and Feeding.—Bartlett, Maine, Bulletin No. 184.—Jaffa California Bulletin No. 164.

NOTE—In some cases the digestible coefficients appear higher than the composition as determined by chemical analysis; this is probably due to a difference in the samples analysed.

In highly concentrated feeds there is often a considerable variation in the composition of different samples so that it is always advisable to buy and to feed according to a guaranteed analysis.

Unless care is taken, there is liable to be trouble on account of bad-flavoured eggs, but if a suitable brand of scrap is used, and it is not too heavily fed, there should be no trouble.

COMPOSITION AND DIGESTIBLE NUTRIENTS OF FEEDS—Con.

Foods.	PROTEIN.		CARBO- HYDRATE.		FAT.		NUTRITIVE RATIO.	
	Total.	Digestible.	Total.	Digestible.	Total.	Digestible.	Total.	Digestible.
VEGETABLE.								
Apples.....	.7		10.6		.4		1:26	
Artichoke.....	2.0	2.0	18.0	18.0	.2	.2	1:6.2	1:3.6
Beet tops.....	2.0	1.7	4.4	4.0	.4	.2	1:2	1:2.0
Beets (garden).....	1.8	1.2	8.0	8.8	.1	.1	1:3.4	1:7.3
Beets (sugar).....	1.8	1.1	9.8	10.2	1.1	1.1	1:3.8	1:9.4
Beets (mangel).....	1.4	1.1	5.5	8.4	.2	.1	1:4.2	1:5.1
Cabbage.....	2.4	1.8	3.0	8.2	.4	.4	1:2	1:5
Carrot.....	1.1	.8	7.6	7.8	.4	.3	1:7.7	1:10
Parashe.....	1.0	1.0	10.2	11.2	.2	.2	1:6.6	1:7.2
Potato.....	2.1	.9	17.3	14.0	.1	.1	1:3.3	1:14.0
Pumpkin (field).....	1.3	1	5.2	5.8	.4	.3	1:4.0	1:6.4
Turnip.....	1.1	1	6.2	7.2	.2	.2	1:6	1:7.6
Sprouted oats.....	4.7		23.6		1.8		1:3.6	
Silage (corn).....	1.7	.9	11.0	11.3	.8	.7	1:7.8	1:14.2
Silage (clover).....	4.2	3.0	11.6	13.5	1.2	1	1:3.4	1:7.8
Rape.....	2.2	1.5	8.4	8.1	.8	.3	1:4.1	1:5.6
Alfalfa (green).....	4.8	3.0	12.3	12.7	1	.8	1:3	1:3.8
Clover (green).....	3.8	2.6	10.0	1.5	.9	.3	1:3.4	1:8.8
Barley fodder.....	2.7	1.9	8.0	10.2	.6	.4	1:3.4	1:5.3
Green corn fodder.....	1.8	1	12.2	11.6	.5	.4	1:7.3	1:12.6
Oats, fodder.....	2.4	2.6	19.3	18.9	1.4	1	1:3.6	1:3.1
Rye, fodder.....	2.6	2.1	6.8	14.1	0.6	.4	1:2.1	1:7.1
Lawn clippings (green).....	2.3		12.8		1		1:3.9	
Alfalfa hay.....	14.3	11.0	43.7	36.6	2.3	1.2	1:3.3	1:3.8
Clover hay.....	12.2	8.5	37.3	27.4	3.4	1.5	1:3.4	1:4.7
Rowen (mixed).....	11.6	7.9	20.4	40.1	3.1	1.5	1:3.0	1:5.4
ANIMAL.								
Green cut bone.....	22.3				16.5		1:0.7	
Meat scraps.....	71.2	65.0	.3		13.7	13.01	1:0.4	1:0.4
Blood meal.....	84.1	52.3	.0	.0	2.5	2.5	1:0.09	1:1.1
Dried fish.....	48.4	44.1	.0	.0	11.6	10.3	1:0.5	1:0.5
Fresh fish.....	10.5		.0		2.8		1:0.6	
Milk (fresh and whole).....	3.6	3.0	4.9	4.0	3.7	3.7	1:3.0	1:3.6
Milk (skimmed).....	3.2	3	5	4.95	.6	.53	1:1.0	1:2
Buttermilk.....	4	3.9	4	4	1.1	1.1	1:1.0	1:1.6
Whey.....	.6	.8	5.1	4.7	.1	.3	1:3.8	1:6.6
Milk albumin.....	13.9	78.6	50.9	8.6	3	.5	1:4.1	1:0.1
Eggs (hen).....	11.9				9.3		1:1.6	
Eggs (duck).....	12.1				12.5		1:2.3	

Milk.—Milk in its various forms is highly valuable for all kinds of poultry. It may be used either as a drink or to mix the mash. Buttermilk is very highly thought of, and rightly so, many claiming that it is not only an excellent food in itself but is also valuable to stimulate digestion and keep the birds in a good, healthy condition. It has been found more satisfactory to feed milk either always sour or always sweet, rather than sour one time and sweet the next, as, fed in the latter manner, it is liable to cause bowel disturbance. Milk produces quality, whether in the growing stock, the laying pen, or the fattening crate, and, where milk-fed chickens have once been marketed, consumers will always ask for them.

Cottage Cheese.—Where an abundance of milk is available it may be used in the form of cottage cheese, which is greedily eaten by all kinds of poultry.

This is prepared by allowing the milk to sour until it becomes thick. A gentle heat is then applied, which will cause the whey to separate from the curd. The whey is then drained off and the "cottage cheese" remains. This may either be fed as it is or mixed in the mash.

Eggs.—Eggs are sometimes fed. These are usually infertile eggs that are tested out of incubators. Where good, sound eggs are used, they are a valuable source of food, but if eggs in which the germ has started and afterwards died are used, as they frequently are, it is necessary to use caution in feeding them, as they often produce bad results.

MINERAL FOODS.

As a considerable percentage of the dry matter in both eggs and fowls is composed of mineral elements, it is evident that, with a rapidly growing bird or with a fowl that is producing a large number of eggs, the demand for foods containing these elements will be urgent. Under free range conditions, these will be largely obtained through the ordinary feeds, and by the green food, grubs, and grit that are picked up on the range. When fowls are more or less closely confined, it becomes necessary to supply the mineral foods, and the question of the most suitable form in which they can be obtained becomes important. Besides what is supplied through the feeding of alfalfa, clovers, bran, and other ordinary feeds, it is necessary to feed something that contains these elements in such quantities and condition that they can be assimilated more freely. Bones, shells, grit, and charcoal are the feeds that are generally used to supply these requirements.

Bones.—It has already been stated that green cut bone is one of the best forms of animal food. It is also excellent to supply mineral elements. Bone meal or granulated bone is also used for this purpose, the granulated form being usually fed in hoppers, and the meal fed in the mash.

Shells.—Shells of various kinds are used largely, but by far the most popular are oyster shells. These are crushed and separated into various sizes according to the purpose for which they are intended. When fowls are laying heavily they will consume large quantities of shell.

Grit.—Commercial grit is made by crushing rocks of various kinds into sizes suitable for the different classes of fowl. Its chief function is to assist in the grinding of the food in the gizzard, but, undoubtedly, some of the mineral elements are assimilated.

Charcoal.—Charcoal is being used much more at present than formerly. It is inexpensive, and as the fowls will eat considerable quantities of it when they can get it, it is well to supply it at all times. It is not advisable to feed it powdered in the mash, as is sometimes done, but a hopper of the granulated size should be kept constantly before the flock, so that they can help themselves when they are so inclined. It is doubtful if there is any nutriment in it, but it is valuable as a corrective for digestive and bowel disorders.

FEEDING METHODS.

In feeding, regularity is essential no matter what method is followed.

There are many methods that give satisfactory results. What suits one feeder may not suit another, so that it is necessary for individual poultry keepers to decide for themselves just what system of feeding they will adopt. It will be found that best results are obtained where a certain amount of the grain fed is ground. This may be fed either as a moist mash or dry in hoppers according to the personal preference of the feeder.

THE HOPPER SYSTEM.

For some years the feeding of a dry mash in hoppers has been very popular, especially on large plants where labour has to be considered. This system has some advantages and some disadvantages, but the former greatly overbalance the latter.

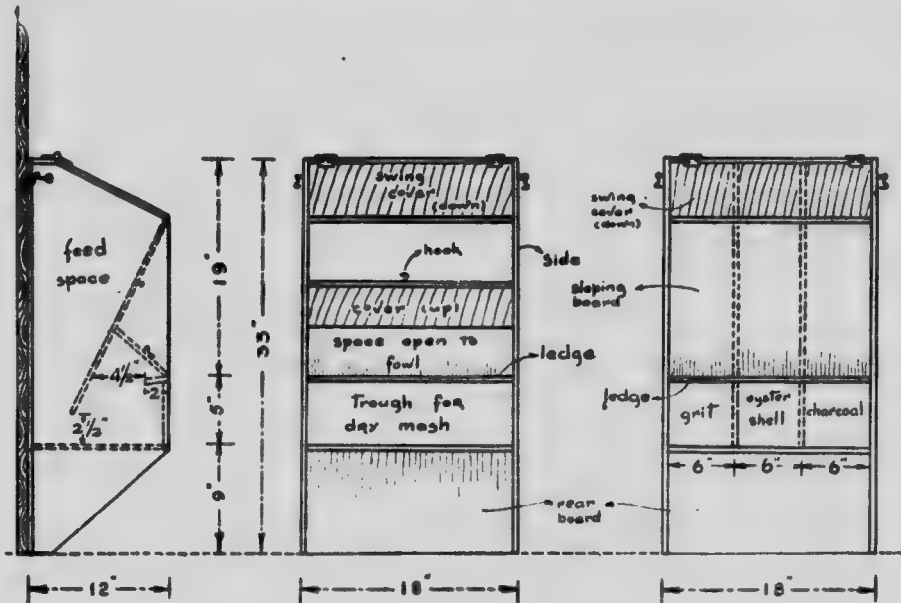


FIG. II.—INDOOR HOPPERS.

Right.—End view of dry mash hopper with cover over feed trough down.

Centre.—Front view of dry mash hopper with cover over feed trough up.

Left.—Front view of grit hopper. The end view would be similar to that of the mash hopper except that it is not necessary to put the cover over the troughs.

The principal disadvantage is the waste of feed by the scattering of it out of the hoppers. This can be largely avoided by the use of properly constructed hoppers or by the closing of the hoppers except at certain regular periods.

The chief advantages are: The saving of time necessary in the making of moist mashes; the lessened danger of overfeeding by novices, as the dry mash is less palatable than the moist; the possibility of feeding more sparingly with grain, and so keeping the hens more active, as they prefer the grain to the dry mash and will scratch as long as a kernel is to be found.

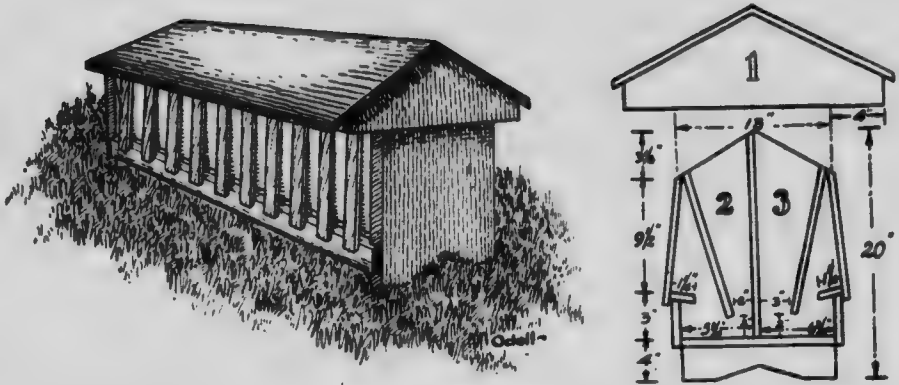


FIG. III.—RANGE HOPPER.

This type of hopper is in more or less favour. The middle partition is made movable so that the two compartments can be thrown into one.

THE MOIST-MASH SYSTEM.

The feeding of a daily moist mash was formerly the favourite method among poultry keepers, and even yet many stick to this method in preference to the hopper system.

Some prefer feeding it in the morning, some at noon, and some at night. The time is really immaterial, and should depend on the convenience of the feeder.

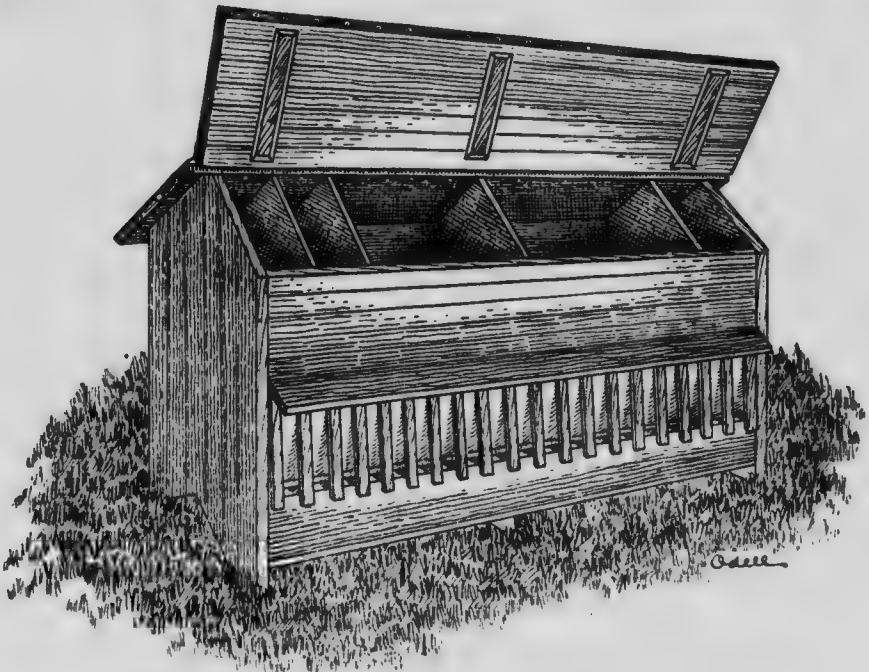


FIG. IV.—ANOTHER TYPE OF RANGE HOPPER.

A range hopper should be large enough to hold sufficient feed to last a considerable length of time, be so constructed that the feed cannot get wet and the feed should flow freely.

Some of the disadvantages are: It takes more time and requires more regularity than the feeding in hoppers, and there is more danger of digestive disorders through overfeeding or through the feeding of improper mashes.

Some of the advantages are: The feeding of a mash makes it convenient to use table scraps, vegetable parings, and other kitchen waste. It is more palatable than the dry mash, and it is a convenient way to get fowl to eat alfalfa or other similar feeds.

A combination of the two methods may be used to advantage, especially for the feeding of pullets for egg production.

From what has already been said it will be realized that dependence need not necessarily be placed on any given feeds. So long as it is borne in mind that the various forms of food, cereal, vegetable, animal, and mineral, must be supplied, rations may differ widely in make-up. Farmers should depend largely on home-grown feeds, and when it is necessary to buy, those feeds most readily and cheaply obtainable in the various localities are the ones that should be used. A ration that proved satisfactory last year may be too expensive to use this season, or one that was too expensive last season may be cheapest this. The successful poultry keeper will not only vary the rations according to the prices of feeds, *but also according to the condition of his flock*. A hen that is not laying cannot stand as heavy a ration as one that is producing heavily, neither can a flock of old hens stand as heavy a ration as a flock of pullets.

RATIONS.

The following rations have been used, and have proved satisfactory, and may be adopted or altered to suit conditions.

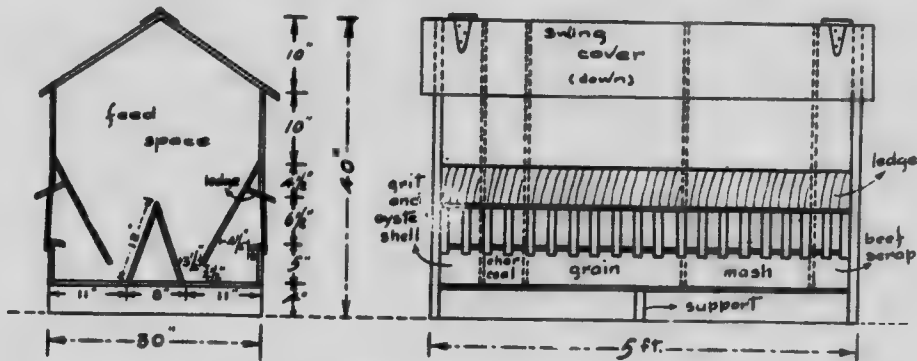


FIG. V.—RANGE HOPPER.

This line drawing shows the plan of the Range Hopper shown in Fig. IV. The top is covered with ready roofing. This stops short of the ridge over which is fastened, with cement paint, a strip of heavy canvas thus making an absolutely water-tight cover.

FOWL.

Chicks.—Chicks should not be fed until they show positive signs of hunger, which will be between two and three days after hatching. They should then be fed a little at a time and often—say five times daily, depending on light, easily digested feeds such as bread crumbs slightly moistened with milk, or bread crumbs and curds, just enough scratch grains being fed to get them used to them. The chicks should have access to a dish of dry mash so as to get them started

on this feed as soon as possible. This light feeding should be continued for about a week, when the feed may be gradually increased, at which time it may be about as follows:—

*First feed, bread crumbs moistened with milk, just what the chicks will clean up, on a little clean sand or chick grit; second, finely cracked mixed grain; third, rolled oats; fourth, moistened bread crumbs; fifth, finely cracked mixed grains. If too early to get the chicks on grass, green food is supplied in the form of young lettuce, sprouted grains, or any other tender, succulent food that is acceptable. After the chicks are ten days to two weeks old, coarser feeds are allowed and the bread and milk discontinued. All changes are made gradually. When on range, hoppers, in which are placed grains and dry mash or rolled oats, should be put where the chicks can have free access to them. As soon as they become accustomed to the hoppers, the hand-feeding is reduced to the mash feeds and, if the chick are on good range, it will be found that after a time they will get careless about coming when called. The mash may then be dropped and dependence placed entirely on the hopper feeding. Place grit, water and a dish of sour milk where the chicks will have free access to them.

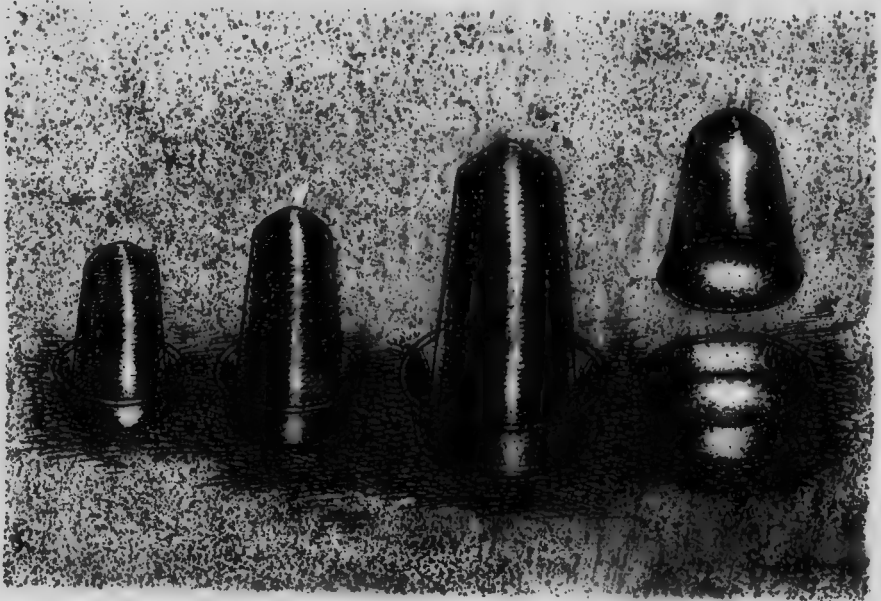


FIG. VI.—DRINKING FOUNTAINS.

Fountains should be simple of construction so that they may be readily cleaned. Those shown are so simple that explanations are unnecessary. They are made in various sizes for chicks, fowl, or ducks. An empty tomato or similar can with a couple of holes punched in the sides near the top inverted in a saucer makes a first-class chick fountain.

The mash may consist of equal parts bran, middlings, cornmeal, and one half-part fine beef scrap, but the composition is more or less dependent on the feeds that are most available.

¹**Crate Feeding.**—In crate feeding, the use of sour milk is indispensable where high quality is an object. The milk is mixed with finely-ground grain in about the proportion of three pounds of milk to two of grain. This makes a

* If good sound infertile eggs are available they may be used mixed with bread crumbs as a starting feed but care should be taken to see that the eggs are perfectly sound otherwise the results will be bad.

¹ See Experimental Farm Bulletin 98 pages 24-29..

rather thin mash. The birds are fed all they will eat twice a day, at regular intervals, and any food that is left is removed immediately, so as to keep the appetite keen. It is customary to mix a mash a feed ahead so that fermentation may begin before it is fed.

The grains most commonly used are corn, oats, barley, and buckwheat, or some of their by-products, but whatever is used should be finely ground. Corn produces a yellow fat, so that, where white skin is in demand, it is not advisable to use much of it. A mixture that will be found to give satisfactory results consists of equal parts of corn, oats and buckwheat.

From experiments conducted at the Central Farm it was shown that buckwheat screenings gives excellent results. This is a by-product from the elevators, and is composed largely of the seeds of "Wild buckwheat" and shrunken wheat, although there is also a proportion of other seeds. This feed is usually cheap, and as it is palatable and gave such excellent results, it is highly recommended. It was fed mixed with sour milk in the usual manner.¹

Stock Birds.—Grit, oyster shell, charcoal, and dry mash are kept in hoppers constantly before the flock. Fresh water and, when possible, a dish of sour milk is also supplied. In the morning a light feed, and in the evening a full feed, of mixed grain, is given in the litter; at noon, green feed and, if desired, a feed of moist mash. When sour milk is not available, green cut bone may be fed alternately with the moist mash, or coarse beef scrap may be supplied in the hoppers.

The mixed grain usually consists of corn and wheat, equal parts, and oats, half part, but if any other grains are cheaper or more easily obtained, they are used. In cold weather, the proportion of corn is increased, and in hot weather decreased.

The green food consists of roots—mangels preferred—or sprouted oats. Chopped clover is sometimes steamed and mixed with the mash.

The mash mixture is equal parts corn, bran, and middlings, one half-part gluten and one half-part fine beef scrap or blood flour. For old hens, either the percentage of bran is increased in the mash or the hopper is kept closed except at certain times of the day.

TURKEYS.

Owing to the ravages in recent years of entero-hepatitis or black-head, the feeding of turkeys has been regarded as especially difficult. Blackhead is a most serious disease, and one that is responsible for a large mortality, but some of the sickness in young turkeys is due to the coddling and pampering methods that many think necessary in the handling of poults.

Domestic turkeys partake largely of the habits of their wild ancestors, and if they are given as much opportunity as possible to gratify their wild instincts, such as ranging over unlimited areas in search of their food, and roosting in whatever sheltered tree or nook they may select, there will be a minimum mortality. Kept under such conditions it will be found that feeds that are suitable for the rearing of fowls will also be suitable for the rearing of turkeys.

Poults.—The poults are started in the same manner as the chicks; that is, they are fed bread crumbs moistened with milk, this being changed gradually to the mash previously recommended. Chopped onion tops, dandelions, or

¹ See Experimental Farms Report for 1914. Pp. 969-973 for details of these experiments.

any other succulent feeds are liberally added to this, and a dish of sour milk is placed where they can help themselves. They are fed just what they will pick up quickly. Particular care is taken to see that no feed is left lying



FIG. VII.—On Free Range.—The place to raise good vigorous stock.



FIG. VIII.—A pair of good breeders.

around and the poults and chickens are not fed together, as this is one of the ways in which "black head" is readily spread.

As soon as the poults are strong enough they are allowed to range.

On Range.—Turkeys on range are given a light feed of mash in the morning, and grain at night.

Fattening.—Turkeys that have been on good range require very little fattening. They are confined in a pen for a couple of weeks, and are fed all they will consume of ground grains mixed with sour milk, with an occasional feed of corn as a change.

Stock Birds.—The rations previously recommended for stock birds may also be used for turkeys. Clover hay, of which they eat large quantities, is liberally supplied, and roots in abundance. Care is taken to avoid having the breeders become too fat.

GUINEA AND PEA-FOWL.

Guinea and pea-fowl, and birds of similar nature, are handled in the same manner as turkeys, and the ration suitable for the one is equally suitable for the others.

DUCK.

Ducks are voracious feeders, and it is necessary to supply roughage in the form of green food, hay, or roots, liberally. Otherwise, if they are fed generously not only will the cost to keep be too high, but they will become too fat to reproduce properly.

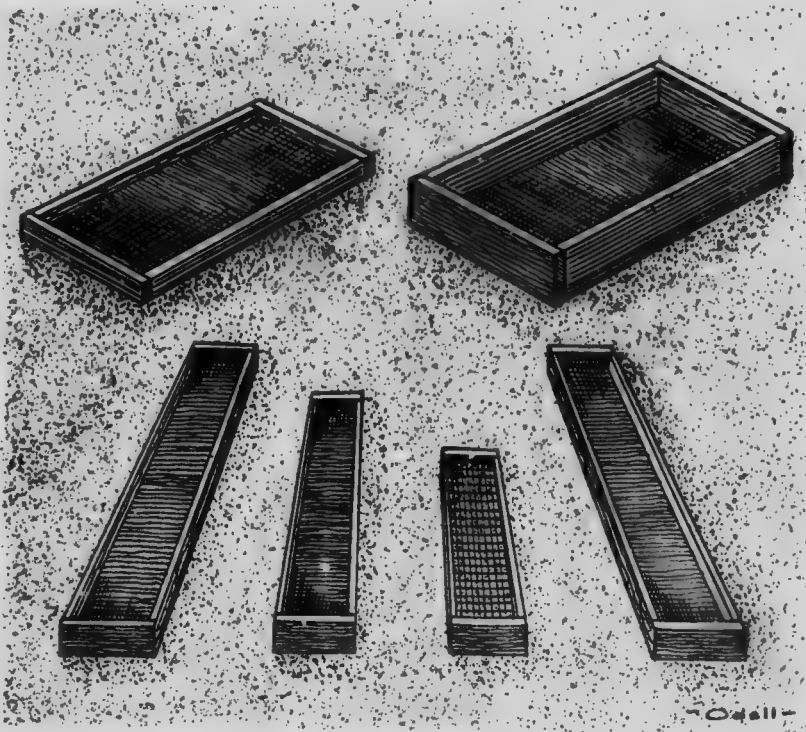


FIG. IX.—SIMPLE TROUGHS.

This type of trough has been found very useful.

Those on the top which are made out of 10" or 12" boards about 12" or 15" long are convenient for feeding mash to chicks or hens. For chicks a strip about 1½" high is nailed around the board, for hens a strip 3" or 4" wide is used.

Those on the bottom row are similar except that they are made long. These are used for duck feeding. The third trough from the left illustrates how the same type of trough may be arranged for feeding chicks dry mash. A strip of ½" mesh wire is laid over the feed to prevent the chicks from scratching it out.

If ducks are on grass range they will thrive on any ration that is suitable for ordinary fowls, but for profitable production it is always advisable to feed largely on coarse, bulky feeds.

Ducklings.—When the ducklings are about thirty-six hours old they are given feed and water. The feed consists of stale bread soaked in milk and dried off with a mash composed of equal parts bran, shorts, and corn meal, and 5 per cent coarse sand. For the first few days the feed is changed before them all the time, but it is changed so as not to become stale. Two days they are fed regularly four or five times a day just what they want to eat up, and any that is left is removed. If milk is not available, the bread is soaked in water, in which case 5 per cent of beef scrap is added. The bread is gradually reduced, and by the time the ducklings are ten days old it is dropped entirely, and the same mash is continued, with the exception that the meat scrap is increased to 10 per cent. A little tender green food is put in the mash after the first couple of days. This is gradually increased until there is as large a proportion of green food used as the ducklings will clean up; this will amount to 20 or 30 per cent in bulk by the time the ducklings are a couple of weeks old. If an inclination to pick out the grain part of the mash and leave the green food is noticed, the proportion of green is reduced.

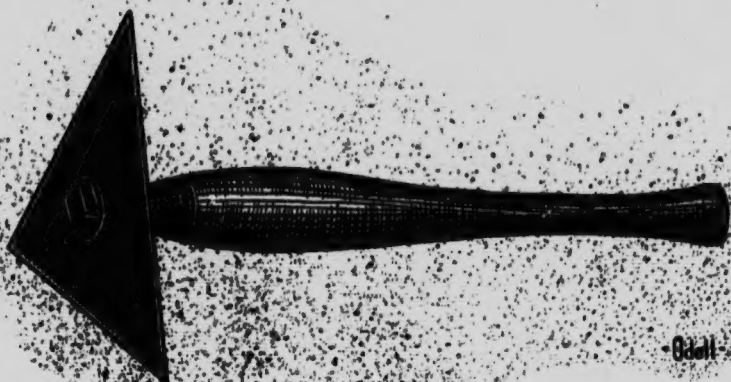


FIG. X.—A CONVENIENT TOOL.

A scraper similar to that shown in the illustration will be found to be very convenient for cleaning out troughs and doing similar work.

This ration is continued for six or seven weeks, when the flock is separated according to the purpose for which they are intended. Those reserved for stock purposes are given a large run where they will have free access to a stream and where they will forage for most of their feed. Those intended for market are placed in the fattening pens without range or water to swim in, and fed three times a day.

Fattening.—For fattening, the proportion of corn is increased and the bran and green food reduced. The feed at this time consists of 1 part bran, 2 parts shorts, 3 parts corn chop, 10 per cent beef scrap, about 5 per cent sand, and the green food is reduced to about half what they had been consuming previously. This mash is moistened to a crumbly state with milk, and an abundance of water is kept before the flock at feeding time. The ducks are marketed at eight to ten weeks of age.

Stock Ducks.—After ducks intended for breeders are separated from the market stock at six or seven weeks of age, they are given a light feed in the morning and a full feed at night of the following mash: Bran 3 parts, shorts 2 parts, corn chop 1 part, with 5 per cent beef scrap and 5 per cent sand, with as much green feed as they will eat. One of the feeds, or at least a part of it, should consist of mixed grains, principally oats and barley. If the range is good, the morning feed is omitted altogether. They are continued on this ration until a few weeks before eggs are wanted, when they are given a mash consisting of 4 parts corn chop, 2 parts bran, 2 parts middlings, 1 part meat scrap, 5 per cent sand, equal parts of either boiled or finely pulped vegetables and cut clover as much as they will consume. The mixed grain is also continued.

Changes from one ration to another are made gradually, and rations are varied according to conditions.

GEESE.

Geese, like ducks, require a large proportion of roughage in the ration. This is best supplied in winter by the use of clover hay and roots, and in summer by grass. Given the range a good pasture, a flock of geese require little else unless it is desired to force rapid growth.



FIG. XI.—STOCK DUCKS ON RANGE AT THE CENTRAL EXPERIMENTAL FARM.

An ideal place to raise the Breeders.

Goslings.—Goslings require warmth and rest the first day, and it is advisable to leave them undisturbed. On the second day they should be placed where they will have free access to a plot of tender grass, otherwise they should be supplied with all the succulent green food they will eat, together with mash fed them three times a day. The feeds recommended for chickens or ducklings are equally suitable for goslings. If it is intended to market the goslings as green geese, it is advisable to feed them mash heavily from the start. If they

are intended for stock purposes, it is better to use more hard grain and, as soon as the goslings get strength enough, they should be allowed freedom to range on the pasture lands, where they will pick up most of their feed, requiring only a light feed of mash in the morning and grain at night.

Fattening.—At six or seven weeks of age, goslings that have been forced from the very start are put on a ration similar to the one recommended for fattening ducks.

Where geese have been kept on pasture all summer, they are penned in the fall and fed heavily on mash feed composed of whatever grains are most available, corn being in especial favour for this purpose; an occasional feed of whole grain being given to whet the appetite.

The fattening period usually lasts from three to four weeks.

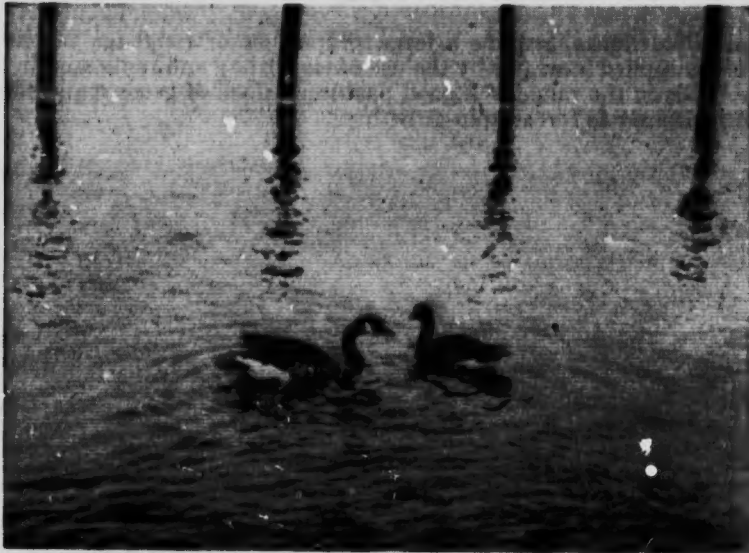


FIG. II.—A PAIR OF BREEDERS. CANADA (WILD) GEESSE AT THE EXPERIMENTAL FARM.

Stock Geese.—When on range, a light feed of mash is given in the morning and mixed grain at night until after the breeding season, when the mash is omitted altogether.

In winter, clover and roots are liberally supplied, and mixed grain (generally oats and barley), with an occasional light feed of mash.

CONCLUSION.

In the foregoing chapters it has been the endeavour to make the subject of feeds and feeding as simple as possible. While it has seemed advisable to try to familiarize the uninformed reader with the more common scientific terms, this has been done only to such an extent as would permit the reader to study and mix feeds intelligently. Wherever terms that might be unusual to ordinary poultry keepers are used, care has been taken to explain them as simply as possible, so that any person reading the bulletin through should have no trouble in following it.

While sample rations are given for each kind of stock, it must not be supposed that these are given as the only rations or even as the best rations. They are simply given as indications of about what the various rations might consist. As heretofore stated, the make-up of a ration should depend altogether on what feeds are available, always bearing in mind the various requirements. War-time rations should consist of such feeds as are not required for human consumption. The milling grades of wheat should be excluded, and only those grades used that are unsuitable for the making of flour. As the supply of feed wheat is necessarily limited, the percentage used in the ration should not be any greater than is absolutely required for the most profitable production and as mash constituents such as bran, middlings, and similar feeds are generally much lower in price than whole grains, it is advisable at this time to induce the fowl to consume a larger proportion of this type of feed than is generally used.